



STATE OF MISSISSIPPI

HALEY BARBOUR

GOVERNOR

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

TRUDY D. FISHER, EXECUTIVE DIRECTOR

September 14, 2007

Mr. Tom McGill, Acting Chief
Standards, Monitoring and TMDL Branch
Water Management Division
U.S. EPA, Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Dear Mr. McGill:

MDEQ has revised Mississippi's Plan for Nutrient Criteria Development. Enclosed is our revised plan for your review and mutual agreement. If you have any questions, please contact Kim Caviness at (601) 961-5390.

Sincerely,

A handwritten signature in black ink, appearing to read "Wm Stephen Spengler".

Wm Stephen Spengler, P.E.
Chief, Surface Water Division

Enclosure

OFFICE OF POLLUTION CONTROL

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Mississippi's Plan for Nutrient Criteria Development



Submitted To EPA Region IV

(Revised July 2007)

Prepared by:

**Mississippi Department of Environmental Quality
Office of Pollution Control
P.O. Box 10385
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I. INTRODUCTION

The Environmental Protection Agency (EPA) has published recommendations of water quality criteria for nutrients under section 304(a) of the Clean Water Act (66 FR 1671). EPA has stated that they developed the criteria with the intention that they serve as starting points for states to develop more refined nutrient criteria, as appropriate, using EPA water body-specific technical guidance manuals and other scientifically defensible approaches. EPA emphasized that the states have several options available to them in developing and adopting water quality criteria for nutrients. One of the EPA recommended approaches is that wherever possible, the states develop nutrient criteria that fully reflect localized conditions and protect specific designated uses using the processes outlined in the EPA technical guidance manuals. In addition, EPA recommended that states develop a nutrient criteria plan to outline their process for how and when they intend to adopt nutrient criteria into their water quality standards.

The purpose of this plan is to provide EPA with a better understanding of Mississippi's approach to nutrient criteria development. The plan allows the State to take advantage of the flexibility to develop criteria that reflect local water conditions as opposed to EPA's national criteria recommendations. The Mississippi Department of Environmental Quality (MDEQ) considers this plan to be an interactive plan and will continue to work with EPA Region IV to refine the plan as needed during the coming years. Because of the significance and magnitude of this undertaking and the data gaps already identified for Mississippi's water bodies, MDEQ is certain that the specifics of this plan will change with time as water quality assessment activities are planned and carried out. It is realistic to expect that as new information is considered, some steps may take longer or shorter than anticipated at this time. We also expect that our greatest challenge will be to obtain sufficient funding to support the field and laboratory investigations necessary to provide adequate assessments.

MDEQ has accomplished and will accomplish the following activities: (1) established a Nutrient Task Force (NTF) during FY2000 comprised of Federal and State experts, to review historical nutrient data, identify data gaps, help develop our approach, recommend additional monitoring and data collection, recommend water body classification systems, review data, and recommend nutrient criteria for Mississippi water bodies; (2) periodically prepare reports which present the progress of developing nutrient criteria; and (3) submit scientifically defensible nutrient criteria to EPA for review and approval in accordance with agreed-upon timelines. MDEQ plans to coordinate nutrient criteria established for each water body type to ensure consistency throughout the systems. MDEQ anticipates development and adoption of nutrient criteria for lakes and reservoirs, rivers and streams, and coastal and estuary water bodies state wide to be completed by 2011.

II. CONCEPTUAL APPROACH

The focus of our strategy will be to develop nutrient criteria based primarily on the linkage between nutrient concentrations and impairment of designated uses. For the purposes of this document, "nutrient criteria" are defined as one of, or potentially a combination of, three forms:

- Causal and/or response variables expressed as numerical concentrations and/or mass quantities or loadings

- Casual and/or response variables expressed as narrative statements with a translator mechanism to derive or calculate numerical concentrations and/or mass quantities or loadings
- Casual and/or response variables expressed as narrative statements only.

We will consider all of the above criteria forms when establishing criteria for causative variables (such as phosphorus and nitrogen) and response variables (such as chlorophyll *a* and turbidity) that are associated with the prevention and assessment of eutrophic conditions. It is possible that a combination of numeric criteria and narrative criteria with translators will be developed for some Mississippi water bodies. Also, it is possible that Mississippi may derive criteria based on a “reference condition approach.” Using a reference condition approach, water quality criteria are derived from data collected at least disturbed sites, and an upper percentile of the data is taken to establish the numeric criteria. The flaw in this approach is that it does not provide a definite link between nutrient concentrations and impairment. But rather, it presents statistically-derived values for causal and response variables from sites that are known to be least impacted by man. It says nothing about the water body’s capacity to assimilate nutrient inputs. Additionally, by definition, a portion of the water bodies will not attain the water quality standard, even if their designated uses are being attained. However, it has been portrayed by EPA to be an acceptable and scientifically defensible approach, and some other states have used it already to derive criteria.

An effects-based approach is undoubtedly the preferred means to arrive at values that are neither over nor under protective; however, due to our lack of time, resources, etc., the reference condition approach may be used in certain water body types. Much like the States of Virginia and Indiana, we will look for cause/effect relationships between nutrients and impairments, and if those relationships cannot be elucidated, then our “fallback” positions may be to set reference-based or designated uses-based criteria.

A. Classification Schemes

Mississippi is covered by EPA’s aggregate ecoregions IX, X, and XII. Data will be examined on the basis of Level III and Level IV sub-ecoregions. Where significant differences exist between sub-ecoregions, the nutrient criteria may be established at the sub-ecoregion level. Where no significant difference is found between sub-ecoregions, the data will be aggregated back to the ecoregion level. It is also possible that Omernick’s ecoregion boundaries may be modified, or that further delineation within a Level IV sub-ecoregion may result based on analysis of the data.

B. Reference Conditions

Candidate water body reference conditions will be determined from compiled data and with the help of the experts on the Nutrient Task Force who are familiar with the water body resources of Mississippi.

C. Protection of Designated Uses

Mississippi's use classifications include public water supply, shellfish harvesting, fish and wildlife, recreational, and ephemeral streams. The EPA technical guidance manuals will be used to gain additional understanding of ways to ensure that the nutrient levels we establish are protective of the designated uses that comprise the use classifications.

D. Data Screening

We have begun by screening the existing STORET, USGS, USDA, USACE and other databases for information on water bodies with respect to the four initial parameters of concern. This historical information will be used to establish a perspective on the condition of a given water body and to help establish trends in trophic conditions.

E. Data Collection – Existing and Future Efforts

MDEQ has incorporated an aggressive monitoring and data gathering initiative into existing programs in order to provide nutrient data to support nutrient criteria development. We are leveraging resources and funding from existing monitoring programs such as the Ambient Fixed Stations Network, Basin Wide Network, Beach Monitoring Network, Coastal 2000, and the Gulf of Mexico Program, as well as special projects funded under Section 104(b) (3).

i. Data From The IBI Project

The State of Mississippi 1998 Listing of Waterbodies under §303(d) includes 150 segments on the "Monitored" list and 550 segments on the "Evaluated" list. Evaluated waters are those waters for which no monitoring data exists that can be used to determine whether or not the water body is impaired. The State is committed to collecting the data necessary to confirm the impairment status. As a result, the statewide 303d/IBI biological monitoring project was initiated and data collection and processing activities have been substantially completed. Approximately 475 streams statewide were sampled, with the exception of streams in the Mississippi Alluvial Plains Ecoregion (Ecoregion X). Six teams consisting of MDEQ personnel and private contractors collected biological (benthic communities) physical (habitat assessment, Wohlman pebble count, flow) and chemical (in-situ measurements, nutrients, solids) data from all stations. Field data collection began in January 2001 and ended in early March 2001.

ii. Other DEQ Monitoring Programs

All other on-going monitoring programs have been modified to include the collection of nutrient data. New biological monitoring programs have been initiated to establish biological indices for wadeable streams and additional studies are underway to establish biological indices for non-wadeable streams. MDEQ's surface monitoring program includes the following monitoring networks and special studies:

- **Ambient Fixed Station Network (*Reactivated during 2007*)**. In this statewide monitoring network 61 stream stations are sampled monthly. Forty-one stations in reservoirs and estuaries are sampled on a quarterly basis. Biological sampling is carried out at 25 stations.
- **Basin Wide Network (*currently suspended*)**. Water bodies in each Mississippi basin are sampled on a rotating five-year cycle. One of the five basin groups is targeted annually and sampling is carried out at an average of 80 sampling stations for each basin group. In addition, a one-time sample with rapid bioassessment (RBA) is performed for each basin group.
- **Beach Monitoring Network**. Twenty-two coastal water quality stations are sampled on a routine basis during the year. Nutrient data are collected along with enterococcus data.
- **Special Monitoring Studies**. Special monitoring is provided by funding from the Sections 104(b), 106, 604(b), 319, and the Gulf of Mexico Program Office. In addition, a five year program is underway to monitor coastal and estuarine marine waters under the Coastal 2000 program.

Where resources allow, these monitoring programs will provide data that will be used to support the nutrient criteria development initiative in addition to the main focus of each monitoring program.

iii. **Mississippi Alluvial Plain.**

MDEQ will be gathering nutrient data from the appropriate ecoregions, but in particular, we will plan for special studies in rivers and streams in Ecoregion X. Mississippi has established a work group affiliated with the Yazoo River Basin Team for the development of a methodology to assess water quality in the §303(d)-listed waters in the Mississippi Alluvial Plain ecoregion. Additionally, the work group will assess existing water quality standards and recommend appropriate standards, including nutrient standards, for the Mississippi Alluvial Plain ecoregion.

III. APPROACH FOR EACH WATER BODY TYPE

A. LAKES AND RESERVOIRS

- i. Goal:** Adopt scientifically defensible water quality nutrient criteria to protect the designated uses of Mississippi lake and reservoir water bodies from the adverse effects of over-enrichment.

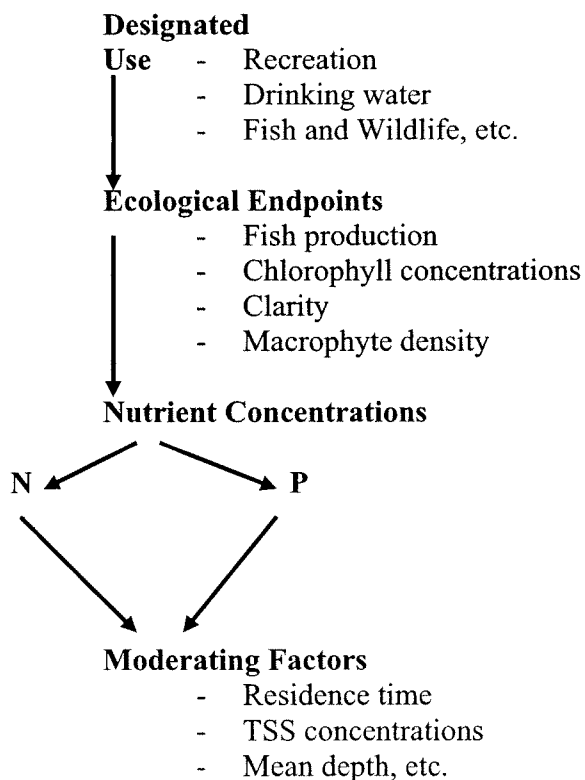
Objective 1: Determine the highest attainable designated use for the natural regions and subregions of Mississippi lake and reservoir water bodies.

Objective 2: Develop scientifically defensible nutrient criteria that will protect this designated use from adverse effects of over-enrichment in each region and subregion.

Objective 3: Incorporate these nutrient criteria into nutrient WQS for each natural hierarchical grouping of Mississippi lake and reservoir water bodies.

Nutrient concentrations, *per se*, (with the exception of unionized ammonia toxicity and human health nitrate criteria of 10 mg/L-N) convey little information about the condition of aquatic ecosystems or their capacity to support designated uses. It is the response to nutrient concentrations that are relevant in aquatic ecosystems. Therefore, effects-based criteria represent the preferred approach for the development of nutrient criteria. These nutrient criteria should reflect local conditions and protect specific designated uses as described in the EPA Technical Guidance Manuals (EPA 2000, 2001). In addition to an effects-based approach to the development of nutrient criteria, other scientifically defensible methods and appropriate water quality data may be considered.

Because water quality standards are comprised of designated uses, water quality criteria, and an anti-degradation requirement, an alternative approach to reference systems is to start with the designated uses, identify ecological endpoints that can be associated with these designated uses and then develop a conceptual model showing the linkage among designated uses, ecological endpoints, nutrient concentrations and factors affecting the expression or response of the endpoint to nutrient concentrations:



Some of the ecological endpoints that were associated with designated uses are shown in Table 1. Some of the factors that might moderate the effects or response to nutrient parameters are shown in Table 2.

Table 1. Example ecological endpoints associated with designated uses.

Ecological Endpoint	Designated Use(s)
Biodiversity (Sustainability)	Aquatic Life Use
Fish Production	Aquatic Life Use
Chlorophyll Concentrations	Drinking Water, Aquatic Life Use
Water Clarity	Recreation, Drinking Water, Aquatic Life Use
Macrophytes	Recreation, Aquatic Life Use
TOC	Drinking Water
Harmful Algal Blooms	Aquatic Life Use, Drinking Water
Algal Blooms	Aquatic Life Use, Drinking Water

Table 2. Example factors that may moderate nutrient effects.

Category	Factors
Physical	Different classification perspective (e.g. ecoregions, watersheds) Residence time Land use/land cover Morphometric attributes (mean depth, surface area) Geology Clarity Watershed physiography Water temperature Climate (precipitation)
Chemical	Alkalinity PH DO TOC/DOC TSS

While there are additional variables that might be considered, these factors represent an initial starting point in the analyses. The successional stage of the lake or reservoir might be important in establishing different categories for nutrients. Similar information can be used to identify clusters of lakes or reservoirs through multivariate or exploratory statistical analyses.

A reference condition approach to the development of nutrient criteria being considered is comparing the §303(d) list of impaired lakes with those that are being analyzed to determine if any of these water bodies are on the §303(d) list, and the reason for listing. This comparison can be used to determine if any water bodies are listed because of nuisance algal blooms or low dissolved oxygen (DO). Lakes and reservoirs listed for these parameters can be used to establish nutrient concentrations associated with these nutrient-related impairments, thus allowing reference condition values to be discerned, which, if exceeded, indicate lakes and reservoirs in poor condition.

The lakes currently under analysis should also be compared with those lakes that are part of the ambient monitoring network. In addition, ambient monitoring lakes should have a time series of nutrient concentrations, which might permit trend analysis to determine if nutrient concentrations have changed over time. Finally, the conceptual model shown above can be used to assess the relationships among listed lakes and non-listed lakes to see if the relationships follow a predictable continuum of response. Other procedures for developing numerical nutrient criteria for lakes that are being considered include the model prediction and extrapolation method mentioned in the EPA Nutrient Criteria Guidance (EPA 2000), and setting nutrient criteria to existing concentrations in lakes currently supporting designated uses.

Other key factors that must be addressed in defining and developing nutrient criteria include: geographic region, water body types, seasonality, and designated uses.

a. Geographic regions. Lakes in different areas in the State may have different nutrient concentrations depending on native soil types, surface and groundwater hydrology, land use, ecoregions, physiographic areas, and watersheds and basins. Different criteria might be required in these different geographic regions.

b. Lake types. Different water body types (e.g., oxbows, large reservoirs, etc.) can have different critical conditions at which nutrient concentrations impair designated uses. If the nutrients and critical conditions vary greatly between water body type, each category will require different criteria.

c. Seasonality. Many ecological endpoints such as chlorophyll concentrations, fish production, recreation, etc. have definite seasonal components that might require different nutrient criteria for these seasons.

d. Designated uses. The Clean Water Act requires that States designate a use for each water body and develop criteria that will protect and support the highest attainable designated use. The designated uses for lakes and reservoirs will be considered as the foundation for the development of nutrient criteria.

ii. Form

The form of the nutrient criteria for lake and reservoir water bodies will be effects-based rather than EPA's default §304(a) criteria for nutrients. These effects-based nutrient criteria will, wherever possible, reflect local conditions and protect specific designated uses.

iii. Regionalization

Water quality data collected as part of the inventory and being collected on Phase I lakes will be evaluated to determine if water quality in lakes differs by regions. The region designations that will be evaluated are ecoregions, river basins, and physiographic regions. Statistical analyses including ANOVA and cluster analysis will be used to determine if water quality in lakes differs by region.

iv. Classification

The initial classification of Mississippi lakes was to determine which lakes are Waters of the U.S. or Waters of the State, and thus subject to the Clean Water Act. Mississippi lakes that are subject to the Clean Water Act have been put into classes based on size (surface area greater than 500 acres, between 500 and 100 acres, and less than 100 acres), type [large reservoir (>4000 acres), reservoir, oxbow], successional stage, whether or not they are fertilized, and whether or not they are on Mississippi's §303(d) list. Other classes might be identified as data analysis occurs.

v. Prioritization and Coverage

Information from USGS's Geographic Names Information System and various other sources indicated there were 938 named lakes/reservoirs/ponds in Mississippi. One hundred thirteen lakes comprise over 90 % of the total surface area of lentic water bodies in Mississippi. In addition, 84% of the total surface area of Mississippi lentic water bodies was represented by the 40 largest lakes and reservoirs (i.e., >500 ac), as depicted in Figure 1 below.

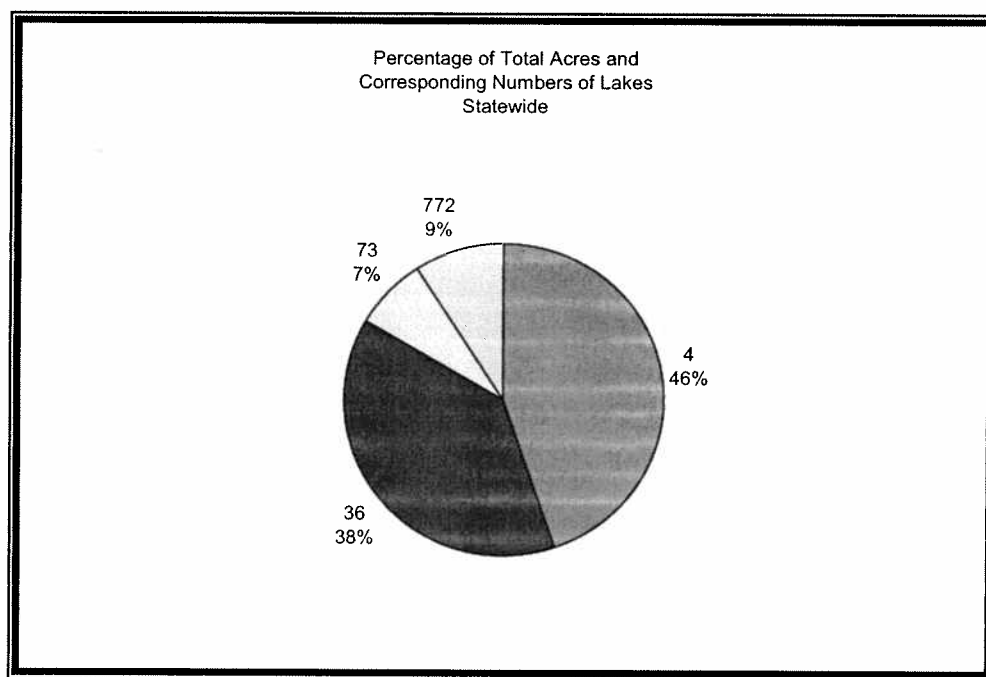


Figure 1. Surface Area of Mississippi Lakes

The first priority, therefore, is to develop criteria on the largest water bodies (i.e., >500 acres). Following the development of criteria for these water bodies, the applicability of these criteria for lakes between 100 and 500 acres will be assessed. Additional criteria will be developed, if needed for these intermediate sized water bodies. Narrative criteria will likely be applied to all

other lake and reservoir water bodies below this intermediate size because these water bodies comprise less than 10% of the lentic surface area in the State. We are also considering using narrative criteria for fertilized lakes. Narrative criteria may be applied to fertilized lakes where numeric criteria cannot provide meaningful guidance due to variation in management procedures.

vi. Inventory of Existing Data

One of the first tasks completed was the development of a database of lakes and reservoirs in the State. A number of external sources were consulted to compile the database. The database includes lake name, size, type, mean depth (where known), management status, and location information such as county, watershed, basin, ecoregion, etc. Some of the information obtained as part of this inventory included:

1. Chlorophyll – Quarterly chlorophyll *a* data collected from 1997 to present are available for six reservoirs. Chlorophyll *a* is being measured approximately quarterly during the Phase I sampling.
2. Phosphorus – Quarterly total phosphorus data collected from 1997 to present are available for six reservoirs. Total phosphorus is also being measured during the Phase I sampling. Ortho phosphorus is also being measured at selected lakes during the Phase I sampling.
3. Total nitrogen – Quarterly ammonia, nitrate + nitrite, and TKN nitrogen collected from 1997 to present are available for six reservoirs. These parameters are also being measured in all lakes included in the Phase I sampling.
4. Turbidity/Secchi depth/TSS – quarterly turbidity, Secchi depth, and total suspended solids measurements collected from 1997 to present are available for six reservoirs.

These parameters are also being measured in all lakes included in the Phase I sampling. Existing data from the 1974 NES and the 1984 Clean Lakes Studies will be added to the database to provide a historical perspective and possible trends in nutrient and endpoint concentrations or values.

vii. Data Collection Needs

We conducted a review of nutrient criteria from EPA and southern states, along with a literature review of studies relating nutrient concentrations to biological and designated use attainment endpoints. From this we gained an understanding of what water quality parameters and relationships would be the most useful to examine in developing nutrient criteria.

Due to resource constraints, we will employ a phased approach for data collection and analysis on 132 lakes and reservoirs for which we plan to develop nutrient criteria. In Phase I, we will collect data and perform data analysis on the 40 largest unfertilized lakes. These lakes account for approximately 84% of the lake surface area in Mississippi. In addition, 10 fertilized lakes will be sampled and data will be analyzed to test the hypothesis that unfertilized lakes and fertilized lakes should be regulated as different classes of lakes.

Phase II will focus on those lakes/reservoirs with surface areas between 100 and 500 acres. Characteristics of this subgroup of lakes will be examined to determine if numerical criteria are appropriate for the entire subgroup, or if there is a logical size break point within this range below which narrative criteria would be appropriate.

viii. Assessing Progress

MDEQ has completed a two year data collection effort targeting 50 of the Mississippi lakes larger than 500 acres. Monitoring is ongoing for 50 lakes between 100 and 500 acres in size. Parameters being measured in this sampling program are conductivity, pH, temperature, dissolved oxygen (mg/l), dissolved oxygen percent saturation, turbidity, chlorophyll-*a*, total organic carbon, turbidity, alkalinity, total Kjeldahl nitrogen, nitrate+nitrite, ammonia, total phosphorus, Secchi depth, total dissolved solids, total suspended solids, carbonaceous oxygen demand, and hardness. Table 3 is a listing of the lakes included in the Phase I sampling program indicating the sample collection that has occurred at each one. At least two full years of data is necessary in Phase I, and three would be preferable. This is a manageable effort that allows us to start building our sparse database and to look for patterns in lake nutrient characteristics. Data from Phase I will help us formulate and refine our approach. This sampling effort was expanded to additional lakes in 2005.

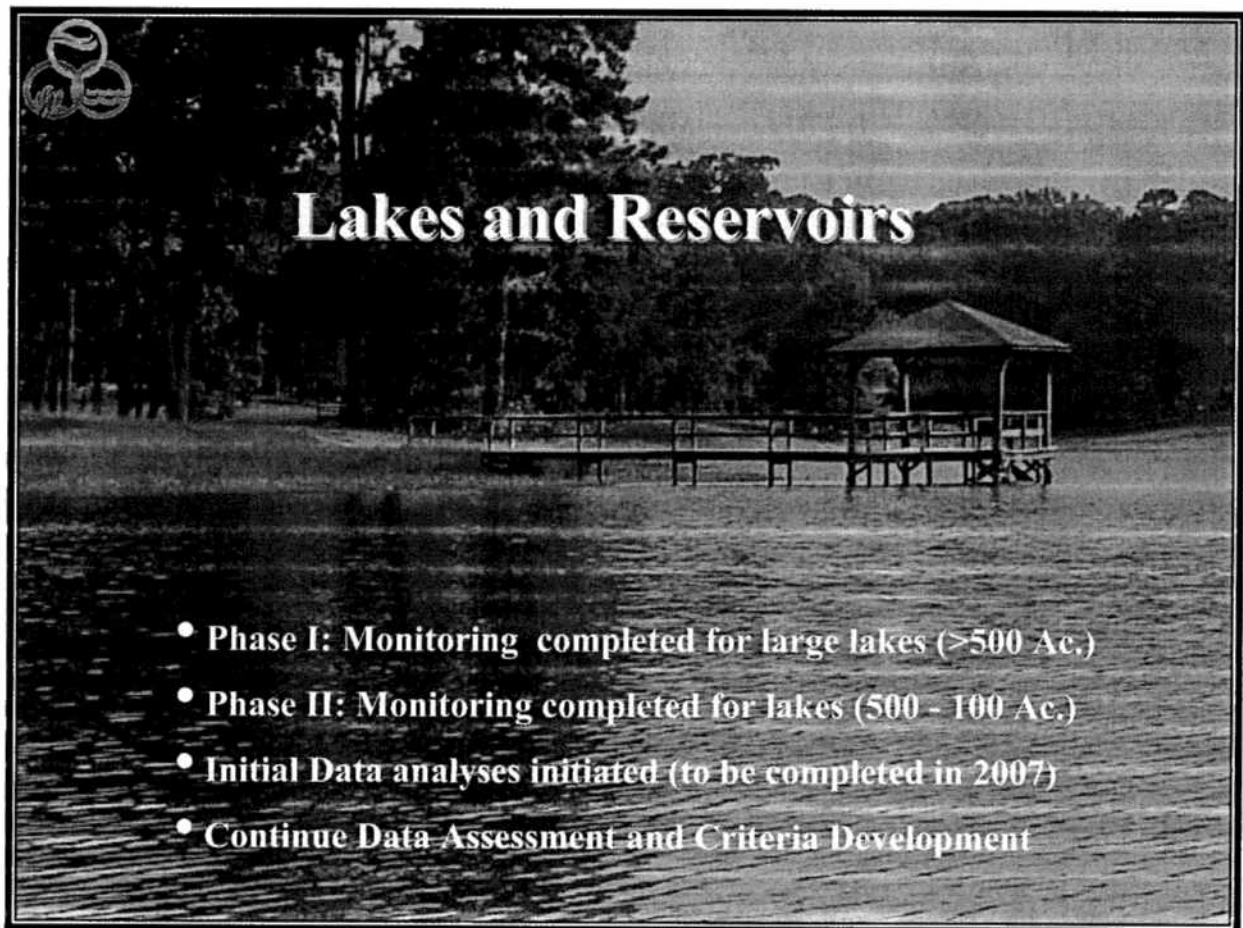


Figure 2. Summary of Progress for Lakes and Reservoirs

Table 1. Summary of lakes sampled during October and November, 2002 (Fall), March and April, 2003 (Spring), and June-August, 2003 (Summer). "X" in cells indicates that sampling was performed for the period indicated. O = oxbow, LR = Large Reservoir, R = Reservoir, Y = yes.

Water Body Name	Sampling Period			Water body Type	Fertilized?
	Fall 2002	Spring 2003	Summer 2003		
Aberdeen Lake	X	X	X	LR	
Arkabutla Reservoir	X	X	X	LR	
Bay Springs Lake	X	X	X	LR	
Lake Bogue Homa	X	X	X	R	
Bee Lake	X	X	X	O	
Lake Beulah	X	X	X	O	
Bluff Lake	X	X	X	R	
Lake Bolivar	X	X	X	O	
Lake Chotard	X	X	X	O	
Columbus Lake	X	X	X	LR	
Dalewood Shore Lake	X	X	X	R	
Desoto Lake	X	X	X	O	
Eagle Lake	X	X	X	O	
Elvis Presley Lake	X	X	X	R	Y
Enid Reservoir	X	X	X	LR	
Lake Ferguson	X	X	X	O	
Flint Creek Reservoir	X	X	X	R	
Geiger Lake	X	X	X	R	Y
Grenada Reservoir	X	X	X	LR	
Hard Cash Lake	X	X	X	O	
Horseshoe Lake	X	X	X	O	
Horn Lake	X	X	X	O	
Kemper County Lake	X	X	X	R	Y
Lake Lamar Bruce	X	X	X	R	Y
Little Black Creek Res	X	X	X	R	
Lake Lee	X	X	X	O	
Lake Lincoln	X	X	X	R	Y
Lake Mary	X	X	X	O	
Lake Whittington	X	X	X	O	
Moon Lake	X	X	X	O	
Natchez St. Park Lake	X	X	X	R	Y
Okatibbee Reservoir	X	X	X	LR	
Pickwick Lake	X	X	X	LR	
Tenn-Tom Pools	X	X	X	R	
Ross Barnett Res.	X	X	X	LR	
Roebuck Lake	X	X		O	
Sardis Reservoir	X	X	X	LR	
Lake Tangipahoa	X	X	X	R	Y
Tchula Lake			X	O	
Tunica Cutoff	X	X	X	O	
Trace State Park Lake	X	X	X	R	Y
Turkey Fork Creek Res	X	X	X	R	Y
Wolf Broad Lake	X	X	X	O	
Lake Washington	X	X	X	O	
Wasp Lake	X	X	X	O	

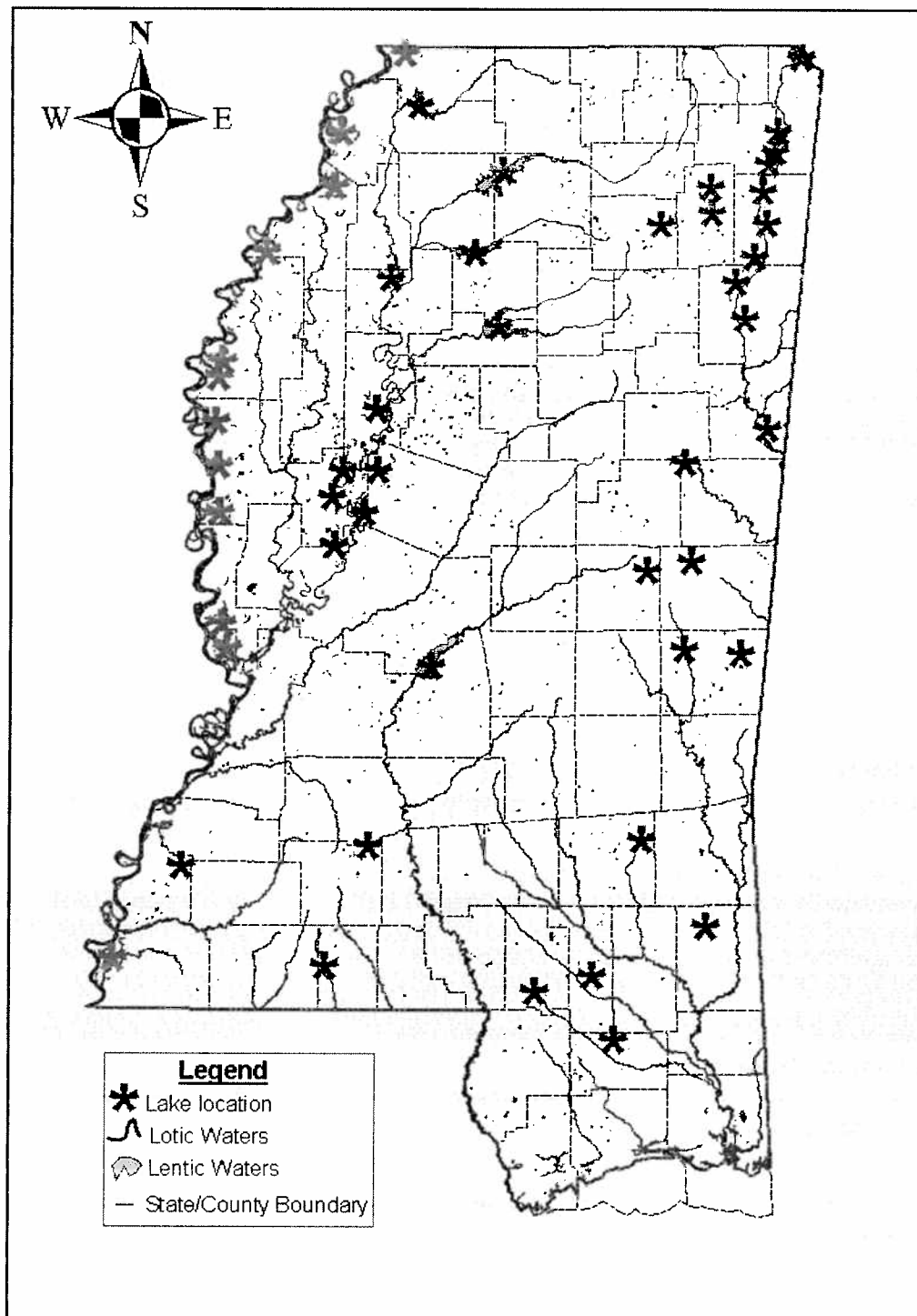


Figure 3. Locations of Sampled Lakes and Reservoirs

ix. Preliminary Data Analyses

Using SYSTAT statistical analysis software, preliminary data analyses have been performed on water quality data from lakes and reservoirs sampled during October and November, 2002 (Fall data), March and April, 2003 (Spring data), and June, 2003 (June data). The purpose of the analyses was to examine the data for general patterns in relationships among variables and among for the ultimate purpose of refining classifications of reservoirs, large reservoirs, and oxbows. The statistical analyses performed were, in general, exploratory analyses rather than tests of specific hypotheses.

x. Schedule and Milestones

The schedule for development of nutrient criteria for lakes and reservoirs is:

2003

- Inventory of All Existing Lake Data
- Design and Implementation of Additional Data Collection
- Phase I Lake Sampling

2004

- Phase I Lake Sampling Continued
- Initiated Analysis of Phase I Lake Sampling and Historical Data

2005

- Initiated Analysis of Combined 2003-2004 Lake Sampling and Historical Data
- Phase II Lake Sampling

2006

- Continued Data Analyses
- Initiate Development of Phase I Lake/Reservoir Nutrient Criteria Targets
- Complete Phase II Sampling
- Initiate Development of Phase II Lake/Reservoir Nutrient Criteria Targets

2007

- Complete Data Analyses for Phase II
- Complete Development of Phase I and Phase II Lake/Reservoir Nutrient Criteria Targets

2008

- Continue Criteria Development Activities

2009

- Coordinate Lake/Reservoir Draft Nutrient Criteria with Draft Nutrient Criteria for Coastal and Estuarine Waters
- Coordinate Lake/Reservoir Draft Nutrient Criteria with Draft Nutrient Criteria for Wadeable Streams

2010

- Coordinate Lake/Reservoir Draft Nutrient Criteria with Draft Nutrient Criteria for Non-Wadeable Streams
- Coordinate Lake/Reservoir Draft Nutrient Criteria with Draft Nutrient Criteria for Delta Streams

2011

- Coordinate Data Analyses and Criteria Development Approaches with Mississippi's Nutrient Task Force
- Coordinate Draft Criteria with Stakeholders and Initiate Review and Comment on Nutrient Criteria for Lakes/Reservoirs
- Complete Public Review and Comment on Nutrient Criteria for Lakes/Reservoirs
- Adopt Nutrient Criteria for Mississippi's Lakes/Reservoirs

B. Streams/Rivers

Initially, MDEQ will attempt to establish effects-based criteria tied to specific designated uses. We will also attempt to collect sufficient data so that we may “fall back” to reference-based or designated uses-based criteria if data do not allow the establishment of effects-based criteria.

i. Form

Initially, MDEQ will evaluate historical data from streams and rivers in Mississippi. Parameters to be evaluated in the historical database will include:

- Field parameters
 - pH, D.O. (instantaneous), temperature, turbidity, and specific conductance
- Phosphorus
 - Total
- Nitrogen
 - Total
 - Dissolved inorganic (alternates: nitrate+nitrite, ammonia, TKN)
- Suspended solids
 - Total
- Habitat assessment
- Benthic macroinvertebrate assemblages

Additional data collection efforts will evaluate the following parameters:

- Field parameters
 - pH, D.O. (instantaneous and diurnal), temperature, turbidity, and specific conductance
- Phosphorus
 - Total
 - Dissolved inorganic (alternate: orthophosphorus)
- Nitrogen
 - Total
 - Dissolved inorganic (alternates: nitrate+nitrite, ammonia, TKN)
- Suspended solids
 - Total
 - Fixed (alternate: volatile)
- Algal-related response variables

- Chlorophyll *a* and Pheophytin (water column)
- Chlorophyll *a* (stream bottom)—wadeable streams only
- Rapid periphyton survey—selected wadeable streams only
- Laboratory identification of algal taxa—selected stations/sample only
- Habitat assessment
- Benthic macroinvertebrates

Upon evaluation of all parameters listed above, MDEQ will determine those indicators that are believed to be scientifically credible in establishing numeric criteria. Data evaluation to determine parameter applicability will include various statistical analyses to identify causal parameters that accurately represent the nutrient characteristics of the given water bodies and response variables that clearly respond to the dynamics of the causal variables. We have initiated exploratory analyses of linkages between historical nutrient concentration trends and low IBI scores. We are currently looking at this relationship to see if it is possible to conclude that the stressed sites are that way because of nutrient concentrations. If we find this to be true, then we may derive nutrient criteria using that data plus additional data that we started collecting in the Spring of 2004. This will provide a much more defensible connection between nutrients and impairment than a simple percentile of all “least disturbed” concentrations. If cause-response relationships cannot be established with confidence, however, a statistical approach which characterizes the percentile distributions of causal parameters from reference conditions may be used.

ii. Regionalization

Upon completion of data collection efforts, MDEQ will use statistical analyses to evaluate all data to determine if natural variability exists in nutrient values and responses in rivers and streams in Mississippi. Frameworks to be evaluated as potential regional strata include ecoregions, basins, various longitudinal and latitudinal geographic regions, system types, physiographic regions, and land use and cover characteristics. The results of data analyses will determine if nutrient criteria will be applied by specific strata and/or substrata, or if stratification is not necessary, and therefore will be applied statewide.

iii. Classification

Through statistical analyses of historical and current data being collected through ongoing data collection efforts, MDEQ will evaluate stream size and season as potential classes for nutrient criteria for rivers and streams, based on the presence of natural variation in these factors. Streams will be evaluated in three groups: (1) Wadeable streams, (2) Non-Wadeable Streams, and (3) Delta Streams.

iv. Inventory of Existing Data

MDEQ has a historical database for use as a basis to derive nutrient criteria or more likely to provide direction and guidance for future data collection needs. This database is primarily composed of multiple data points collected from ambient monitoring stations (@ 62 stations) and

single data points collected during MDEQ's §303(d) assessment project. The ambient monitoring data is composed of different amounts of data from each station, collected at varying frequencies and for varying duration. In addition, data from the ambient stations are either new (post 1997), old (pre 1997) or a combination of new and old data.

v. Data Collection

MDEQ's Nutrient Task Force recommended the following data needs in order to more thoroughly document nutrient conditions and characteristics to be able to derive scientifically defensible nutrient criteria:

- Increase the amount and forms of data to complement MDEQ's existing database by collecting various physical, chemical, biological and land use data from historical stations as well as new stations, representing a gradient of nutrient conditions. This gradient will include streams thought to be very healthy, in poor health due to nutrients and streams of moderate impairment or thought to be at risk for nutrient impairment. Sampling locations will be determined through a combination of a target-based sampling design and a stratified random sampling design.
 - Targeted stations will be selected based on their having been sampled historically and based on an *a priori* selection process that identifies streams that will potentially reflect healthy conditions, conditions that are at risk of nutrient impairment based on land-use and conditions that will potentially reflect severe nutrient impaired conditions.
 - Stratified random sampling stations will be selected using strata that represent ecoregions, stream size and major watersheds or basins, and by determining the proportional amount of streams and rivers represented by each strata. Total available state-wide samples will be divided by proportional allocation within each strata based on its number of river and stream miles so that collected data will be "self-weighting" and directly incorporative into the §305(b) report. Sample reaches will be selected randomly within each stratum. Reaches will be selected through random point generation within the strata using GIS software.
- Collect sufficient data within each major basin to be able to account for downstream effects, and ensure that criteria development in streams complement criteria developed in lakes, reservoirs, estuaries, and wetlands, and are not mutually exclusive and/or conflicting.
 - MDEQ plans to address the lack of data to address these concerns by incorporating a basin-wide sampling plan to collect sufficient data to be able to model nutrient loadings throughout the basin and be able to potentially model the predicted effects of these loadings. This would serve to verify autonomous data collection efforts and criteria development by water body type (i.e. lake, stream, and estuary) and to

modify criteria where necessary, based on a whole watershed framework. This approach will be phased through MDEQ's existing rotating basin data collection plans.

The modeling approach described above would involve a prior knowledge of the nutrient concentrations protective of the downstream water body into which the river system feeds, which means that criteria would first have to be established for nutrient sinks such as large, slow-moving rivers, reservoirs and coasts/estuaries. Once we know what levels of nutrients are protective in the downstream waters, we can calculate allowable inputs from upland waters.

The downside to a modeling approach is that we have started with rivers/streams and have not yet gained a robust dataset for other water bodies. Other states such as Maryland and Virginia started studying nutrients in the Chesapeake Bay many years ago, and are well on their way to establishing nutrient criteria for the Bay. They could therefore more readily use a modeling approach to establish allowable nutrient inputs from freshwaters. We will consider, however, pursuing this approach by collecting data during the rotating basin cycle.

vi. Schedule and Milestones

The schedule for development of nutrient criteria for streams and rivers is:

2003

- Initiated Sampling of Wadeable Streams
- Wadeable Streams Historical Data Analyses

2004

- Analyses of 2003 Wadeable Streams Data
- Continued Sampling of Wadeable Streams
- Design Sampling Plan for Non-Wadeable Streams

2005

- Initiated Analyses of Combined 2003-2004 Data for Wadeable Streams
- Completed Sampling for Wadeable Streams
- Evaluation of Other Stream Classes
- Design and Implementation, if Needed, of Sampling Program for Other Stream Classes

2006

- Continue Data Analyses of Wadeable Streams Data
- Initiated Sampling of Non-Wadeable Streams

2007

- Continue Data Analyses of Wadeable Streams Data
- Continue Sampling for Non-Wadeable Streams
- Initiate Sampling of Delta Streams

2008

- Complete Data Analysis for Wadeable Streams
- Complete Sampling and Laboratory Analyses for Non-Wadeable Streams
- Initiate Data Analyses for Non-Wadeable Streams
- Continue Sampling Delta Streams

2009

- Coordinate Data Analyses and Criteria Development Approaches for Wadeable Streams with Mississippi's Nutrient Task Force
- Development of Draft Nutrient Criteria for Wadeable Streams
- Coordinate Draft Nutrient Criteria for Wadeable Streams with Lakes/Reservoirs Draft Nutrient Criteria
- Coordinate Draft Nutrient Criteria for Wadeable Streams with Draft Nutrient Criteria for Coastal and Estuarine Waters
- Initiate Data Analyses for Delta Streams

2010

- Complete Data Analyses for Mississippi Non-Wadeable Streams
- Coordinate Data Analyses and Criteria Development Approaches for Non-Wadeable Streams with Mississippi's Nutrient Task Force
- Develop Draft Nutrient Criteria for Mississippi Non-Wadeable Streams
- Coordinate Draft Nutrient Criteria for Non-Wadeable Streams with Lakes/Reservoirs Draft Nutrient Criteria
- Coordinate Draft Nutrient Criteria for Non-Wadeable Streams with Draft Nutrient Criteria for Coastal and Estuarine Waters
- Complete Data Analyses for Mississippi Delta Streams
- Coordinate Data Analyses and Criteria Development Approaches for Delta Streams with Mississippi's Nutrient Task Force
- Develop Draft Nutrient Criteria for Delta Streams
- Coordinate Draft Nutrient Criteria for Delta Streams with Lakes/Reservoirs Draft Nutrient Criteria
- Coordinate Draft Nutrient Criteria among Wadeable, Non-Wadeable, and Delta Streams

2011

- Coordinate with Stakeholders and Initiate Review and Comment on Nutrient Criteria for Wadeable Streams, Non-Wadeable Streams, and Delta Streams
- Complete Public Review and Comment on Nutrient Criteria for Wadeable Streams, Non-Wadeable Streams, and Delta Streams
- Adopt Nutrient Criteria for Mississippi's Wadeable Streams, Non-Wadeable Streams, and Delta Streams

This schedule represents MDEQ's best projected approach to developing nutrient criteria for streams and rivers. However, the approach and schedule may be changed because of the uncertainties in the following areas:

- The state of the science supporting criteria development; and
- Difficulty in linking nutrient concentrations to use impacts on streams.

Information gained from discussions with other states and EPA at RTAG, and others, during regional EPA Sponsored meetings may lead to changes in schedules and approaches.

C. COASTS AND ESTUARIES

The President's U.S. Ocean Action Plan released in December 2004 highlighted the Gulf of Mexico Alliance, a partnership formed by the five Gulf State Governors. The President called for increased integration of resources, knowledge and expertise to make the collaboration of the Gulf Alliance a success. Thirteen federal agencies formed a Federal Workgroup, with EPA and the National Oceanic and Atmospheric Administration (NOAA) as co-leads, committed to supporting the Alliance. The Gulf of Mexico Program (GMPO) is the lead for EPA. The Gulf Alliance released an action plan in 2006 as a starting point for effective regional collaboration and addresses specific issues and projects which will result in a healthier Gulf of Mexico ecosystem and economy with a vision toward healthy and resilient coasts and communities in the Gulf of Mexico. An objective of the Gulf Alliance Action Plan is to reduce nutrient inputs to sustain productive Gulf aquatic ecosystems. MDEQ plans to actively support the GMPO and the Gulf Alliance toward achieving the goals of the Action Plan. The Nutrient Criteria development work being performed by MDEQ will be coordinated with the Gulf Alliance Partnership to ensure that MDEQ's criteria development work is fully coordinated with the other coastal states.

Data collection which began during the summer of 2004 and continued through 2007 provides information that can be used in determining causes, effects, and extent of water quality impairment from nutrient enrichment in Mississippi coastal waters. If we are unable to establish those linkages, then as with other water body types, one fall-back position may be to establish reference condition thresholds using a percentile of concentrations at least disturbed sites.

We believe that it is of utmost importance that criteria for these water bodies be related to a measurable impairment of a designated use. Estuaries and coasts are the most downstream of all state waters, and are therefore the ultimate nutrient "sink". Criteria needed to protect these waters can be translated, or modeled, upland to determine allowable loadings from freshwater inputs. We are considering this approach as an alternative to establishing reference condition-based criteria in upland freshwaters, as discussed previously in the Rivers and Streams section of this document.

The general approach will be:

- Review historical data from Mississippi coasts and estuaries to assess status and trends in nutrient concentrations and associated biotic effects;
- Determine what additional data is needed to develop effects-based nutrient criteria for coasts and estuaries;
- Participate in Gulf Alliance Partnership workshops and meetings to coordinate nutrient criteria development activities; and
- Formulate analytical approaches for using historical and additional data to develop nutrient criteria for coastal and estuarine water bodies.

Designated uses for coastal and estuarine water bodies include shellfish harvesting, recreation, fish consumption, and aquatic life support. Effects-based indicators linking nutrients with these designated uses will be included in additional data collection efforts. The approaches being considered for linking nutrients with effect-based indicators include empirical approaches/relationships, loading models, and cause-effect studies.

The Coasts and Estuaries Subcommittee of the Nutrient Task Force is and will be instrumental in the development of nutrient criteria for Mississippi's coastal and estuarine ecosystems. In addition, the Coastal and Estuarine Subcommittee will be closely coordinating with the Rivers and Streams Subcommittee to ensure that nutrient criteria established for Rivers and Streams will be protective of the highest attainable coastal and estuarine designated use.

Other key factors that must be addressed in defining and developing nutrient criteria include: geographic region, water body types, seasonality, and designated uses.

A. Geographic regions

Different areas of the States coastal waters have different nutrient concentrations depending on native soil types, surface and groundwater hydrology, land use, tidal regime, and coast-estuarine hydrodynamics and interactions. Different criteria might be required in these different geographic regions.

B. Water body types

Different water body types (e.g., small bays, riverine estuaries, etc.) can have different critical conditions at which nutrient concentrations impair designated uses. Because the nutrients and critical conditions vary greatly between water body type, each category may require different criteria.

C. Seasonality

Many ecological endpoints such as chlorophyll concentrations, shell fish and fin fish production and harvesting, recreation, etc. have definite seasonal components that might require different nutrient criteria for these seasons.

D. Designated uses

The Clean Water Act requires that States designate a use for each water body and develop criteria that will protect and support the highest attainable designated use. The designated uses for coasts and estuaries were stated above.

i. Form

The form of the nutrient criteria for coastal and estuarine water bodies will be effects-based rather than EPA's default 304(a) criteria for nutrients. These effects-based nutrient criteria will, wherever possible, reflect localized conditions and protect specific designated uses.

ii. Regionalization

The Coastal and Estuarine Subcommittee has considered dividing the Mississippi Sound into regions based on the NGLI/ECOM model that has been used as part of the National Coastal Assessment. The NGLI/ECOM Model considers the variables of wind, river flow, boundary temperature, boundary salinity, and bathymetry and the percent contribution of each parameter to defining a region. Based on salinity resulting from freshwater influence, the Mississippi Sound could be divided into five regions. Region 1- Pearl River, Region 2 – Wolfe and Jourdan Rivers, Region 3 – Back Bay, Region 4 – Pascagoula, and Region 5 – Mobile Bay. Alternatively, the Mississippi Sound might be divided into three major hydrologic subunits based on studies by Eleuterius, Orlando, and NOAA. These proposed hydrologic subunits might be: Western Mississippi Sound, Central Mississippi Sound, and Eastern Mississippi Sound. Within these three major hydrologic subunits, there are a total of eight major tidally influenced river systems. Other regionalization approaches will be considered if it appears there is a scientifically defensible and valid reason for considering alternative regions.

Because estuarine systems are continuous and not discrete water bodies, the development of nutrient criteria will be coordinated with the Gulf of Mexico Program and adjacent states of Louisiana and Alabama. The Gulf of Mexico Program is spearheading an effort to compile and analyze existing nutrient data from all States bordering the Northern Gulf. The "Northern Gulf Pilot Project" is a product of EPA's efforts to demonstrate the methodology described in their Coasts/Estuaries Guidance Document. We have provided a considerable amount of data to GMPO's contractor, and we will rely heavily on the findings to ensure consistency with other Gulf States.

iii. Classification

Within regions, coastal and estuarine systems will be classified according to various factors such as size (e.g., small bays), hydrologic and/or salinity regime, seasonal responses, and other factors that might affect the response of coastal and estuarine systems to nutrient loading and concentration and attainment of designated uses. Classifications will become more apparent upon analysis of the data.

iv. Prioritization and Coverage

Because the large estuaries comprise most of the surface area of coastal and estuarine water bodies, the first priority of nutrient criteria will be for the large estuarine water bodies. The next priority will be to determine if numeric criteria are needed for all coastal and estuarine water bodies, or if there is a size category below which narrative criteria should be retained. If a size category is determined, the applicability of the numeric criteria developed for the large estuaries will be assessed for this intermediate category of estuarine water bodies. Additional numeric nutrient criteria will be developed if the large estuarine nutrient criteria are not considered adequate in protecting and supporting the highest attainable use for these intermediate water bodies.

v. *Inventory of Existing Data*

The Coastal and Estuarine Subcommittee initiated their efforts by conducting an inventory of existing data. This information was supplemented with information from the National Coastal Assessment Program, which has sampled 285 sites in the Mississippi Sound as of November 2005. An analysis and assessment of this data is on-going and was used to design a monitoring program to collect additional information needed to develop nutrient criteria for coastal and estuarine water bodies. The data inventory consists of a number of special studies conducted on the Mississippi Gulf Coast since 1990, ambient monitoring data, beach monitoring data, and National Coastal Assessment data.

vi. *Data Collection*

A data collection program was developed based on guidance used in designing the EPA National Coastal Assessment Program. The stations are given in Table 4 below along with the reason that each station was targeted. The design considered the parameters to be sampled, which included: Dissolved Oxygen, at least one diurnal event, pH, Temperature, Salinity, Turbidity, Total Dissolved Solids, Ammonia Nitrogen, Nitrite plus Nitrate Nitrogen, Total Kjeldahl Nitrogen, Total Phosphate, Chlorophyll *a*, and Benthic Macrofauna. However, because of potential funding limitations, benthics were not included during the first year of sampling. The sampling interval was quarterly, beginning in April 2003. The sampling and analytical methods followed the US Environmental Protection Agency National Coastal Assessment Program Guidance. Diel sampling for DO and nutrients will also occur once during the spring high flow period (e.g., May) and once during the summer low flow period (e.g., August) at all stations. Provided the necessary funding can be obtained, the diel sampling program will be initiated in 2003 and continue through 2005. Data collection locations are shown in Figure 4. Data were lost as a result of Hurricane Katrina. Based on this and other factors, data analyses conducted in 2007 indicated the need for additional collection of Chlorophyll *a* data. Additional data will be collected during the late spring, summer, and fall of 2007.

Detailed analysis of all data and production of reference conditions for estuarine water bodies will be performed using Excel worksheets and SYSTAT statistical analysis software. The results can be made available to other Gulf Coast states and EPA for use in establishing recommendations for nutrient criteria in the Northern Gulf.

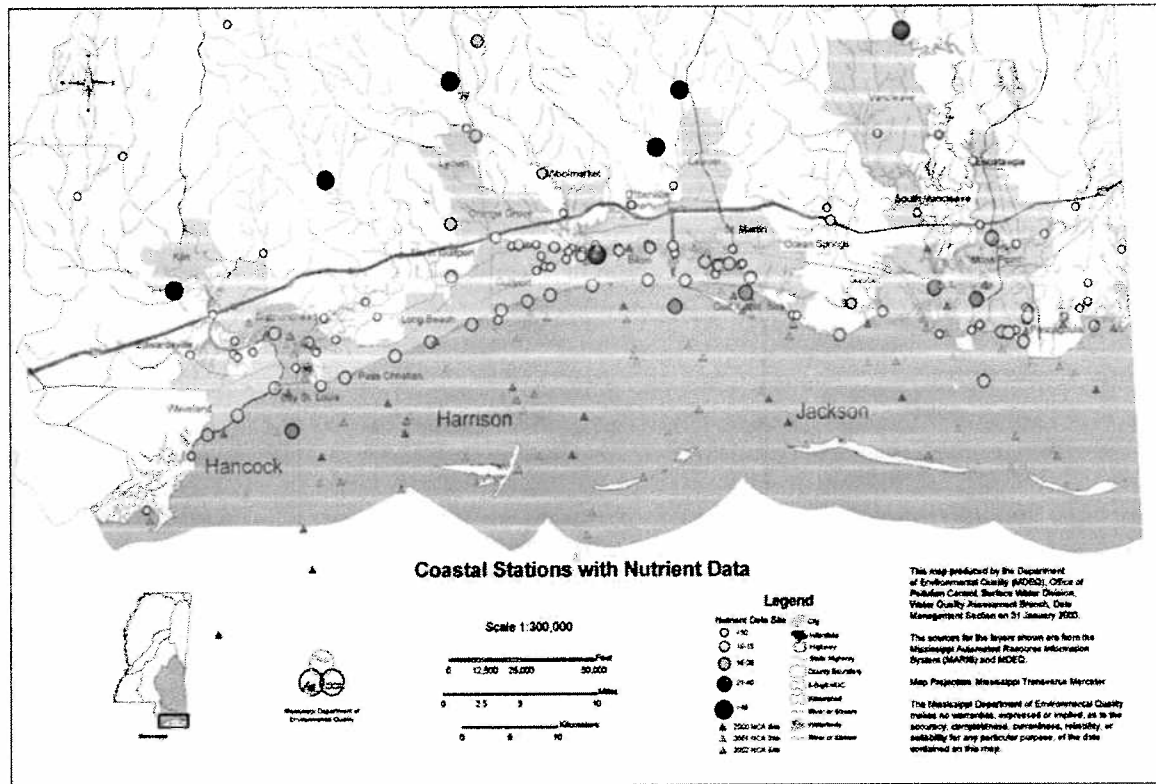


Figure 4. Map of Coastal Sampling Locations

Table 4. Coastal Nutrient Monitoring Stations

Water Body	Recommended Monitoring Sites	Justification for Sampling
Biloxi River	1. One site located near the mouth	1. Increases in TP concentrations, (e.g. 240 to 300ug/L)
Tchoutacabouffa River	1. One site located near the mouth	1. Increases in TP concentrations, (e.g. 130 to 370ug/L)
Confluence of Biloxi and Tchoutacabouffa R.	1. Locate one station at confluence of Biloxi and Tchoutacabouffa Rivers	
Old Fort Bayou	1. Locate site at mouth of Old Fort Bayou at Washington Avenue Bridge	1. Increases in TP concentrations, (e.g. 90ug/L)
Biloxi Bay	1. Site No. 646BBB04 (Ocean Springs) 2. Site No. 02481270 (Biloxi) 3. Site No. BBYB02 (Davis Bayou)	1. 20 previous samples, P spike @1920 ug/l 2. 52 previous samples, P spike @3190 ug/l 3. 18 previous samples, no nutrient spikes
Central Mississippi Sound	1. Site No. MSDB16 (Gautier South)	1. 19 previous samples, nutrient and turbidity spikes
Pearl River	1. Upstream near Highway 90 Overpass	
Industrial Seaway	1. Site No. 02481210	1. Location is common to Bernard Bayou and the Industrial Seaway
Wolf River	1. Site No. 2481527	1. Poor water quality based on TP, TKN, and TN 2. Best water quality based on TP, TKN, and TN
Western Mississippi Sound	1. Site No. 640MSDB02 2. Site No. 640MSDB03 3. Site No. 640MSDB04	1. Poor water quality based on TN 2. Best water quality based on TP 3. Best water quality based on TN, but poor water quality based on TP
Pascagoula River	1. Site No. 02480210	1. Best water quality based on TN during 3 separate seasonal sampling events
East Mississippi Sound	1. Site No. 640MSD03 2. Site No. 640MSDB18 3. Site No. 640MSBD16 4. Site No. 640MSBD17	1. Best water quality based on TN during 3 separate seasonal sampling events, but also had one sampling that would make it a poor water quality station 2. Best water quality based on TN during 2 separate seasonal sampling events, but also had one sampling that would make it a poor water quality station 3. Poor water quality based on TN
Bayou Chicot	1. Site No. CS023	Poor water quality based on TN
Graveline Bayou	1. Site No. 118GRV02	Poor water quality based on TN
Bangs Lake	1. Site No. 109BNG01	Poor water quality based on TN
Point Aux Chenes Bay	1. Site No. 109PAX01	Best water quality based on TN during 2 separate seasonal sampling events
Bayou Casotte	1. Site No. 109CAS01	Poor water quality based on TN during 6 separate seasonal sampling events
St. Louis Bay *	1. Center of the bay 2. Outside the bay in the sound, South of the Intercoastal Waterway * Additional sites to be established during development of monitoring plan.	
Bayou Caddy	Sites to be selected.	The NCA program has a station at the mouth of the bayou.

vii. Schedule and Milestones

The schedule for development of nutrient criteria for coastal and estuarine water bodies is:

2003

- Sampling of Large Estuaries
- Historical Data Analysis

2004

- Continued Sampling of Large Estuaries
- Analysis of 2003 Data for Large Estuaries

2005

- Completed Sampling and Laboratory Analyses
- Evaluation of Other Estuarine Classes

2006

- Analysis of Combined 2003-2005 Data
- Coordinate Data Analyses with EPA Northern Gulf Pilot Study Phase II Coastal Nutrient Data Analyses

2007

- Suspend Data Analyses and Criteria Development Until New Data Collected
- Conduct Additional Water Quality Sampling and Laboratory Analyses for Additional Chlorophyll *a* Data (Late Spring, Summer, and Fall of 2007)
- Initiate Plans for Additional Nutrient and Water Quality Data Collection through Collaboration within Gulf of Mexico Alliance States

2008

- Initiate Data Analyses Including the New 2007 Data
- Participate in Data Collection and Parameter Standardization Efforts with other Gulf States as part of the Gulf of Mexico Alliance
- Re-evaluate Other Estuarine Classes and Data Analyses, as needed, in Collaboration with other Gulf of Mexico Alliance States
- Development of a Criteria Development Approach that is Consistent Across the Gulf of Mexico Alliance States
- Coordinate Data Analyses and Criteria Development Approaches with Mississippi's Nutrient Task Force

2009

- Development of Draft Nutrient Criteria for Mississippi's Coastal and Estuarine Waters
- Coordinate the Coastal and Estuarine Waters Draft Nutrient Criteria with Lakes/Reservoirs Draft Nutrient Criteria
- Coordinate the Coastal and Estuarine Waters Draft Nutrient Criteria with Draft Nutrient Criteria for Wadeable Streams

2010

- Coordinate the Coastal and Estuarine Waters Draft Nutrient Criteria with Draft Nutrient Criteria for Non-Wadeable Streams
- Coordinate with Stakeholders and Initiate Review and Comment on Nutrient Criteria for the Coastal and Estuarine Waters

2011

- Complete Public Review and Comment on Nutrient Criteria for Coastal and Estuarine Waters
- Adopt Nutrient Criteria for Mississippi's Coastal and Estuarine Waters

IV. ADMINISTRATIVE PROCESS

The administrative process for regulatory changes will be as follows:

- Publish a public notice in certain major daily newspapers across the State announcing our intent to adopt nutrient criteria.
- Hold a 30 day public comment period.
- During the public comment period, hold three (3) public hearings across the state (North, Central, and South).
- Prepare a responsiveness summary to all comments received.
- Present recommendations to the Mississippi Commission on Environmental Quality
- Upon approval by the Commission, adopt the changes into the water quality standards.
- Public notice the standards adoption.
- Submit to EPA for approval.

V. INVOLVEMENT OF DECISION MAKERS, PUBLIC AND STAKEHOLDERS

Upon EPA approval, the criteria become applicable and will be implemented. Implementation will likely proceed in conjunction with the rotating basin cycle and with close coordination with the Environmental Permits Division and affected stakeholders. A process will be defined for implementation in TMDL's involving nutrient-related impairments. Presentations will be made at Basin Stakeholders meetings and other coordination/outreach meetings.

VI. PEER REVIEW AND REGIONAL EXPERT GUIDANCE

Some of the data collection will be accomplished under contract with nationally known consulting firms. Four indefinite delivery order contracts are in place that allow MDEQ to quickly initiate work orders for specific work activities. The expertise within these firms combined with the significant level of in-house MDEQ and NTF scientific expertise provides adequate capabilities for quality data collection, analysis, and review.

It is our intent to keep the Region IV Regional Technical Assistance Group informed of our progress at the annual RTAG meetings in Atlanta. To accomplish this we plan to:

- Conduct presentations annually at the RTAG meetings in Atlanta
- Participate in any RTAG conference calls
- Forward the group hardcopies of any public documents or publications that we generate and request their input
- Relay to the group any other significant actions that we take with regards to nutrient criteria development and request their input

In keeping with EPA grant reporting requirements, we will submit summaries of nutrient criteria development activities as one of the elements of the water quality standards program.

VI. CONCLUSION

MDEQ has made a strong commitment of resources and established the NTF to ensure that nutrient criteria development work is carried out in an efficient and productive manner while assuring quality of the final products. Significant in-house and contract resources have been applied to this work and MDEQ plans to maintain this level of commitment through the entire process. Our greatest challenge, however, is to maintain sufficient funding over the project duration to support the field and laboratory investigations necessary to provide statistically significant data. If MDEQ cannot meet the milestones scheduled in this plan, it is likely that the lack of sufficient funding for monitoring and assessments will be the cause.